Operating Instructions

Climate and temperature test cabinet

Type:

Serial no.: **Year of construction:**

Temperature range:-40°C to +180 °C

Humidity range: +10% to + 98% rel. humid. Depend of the equipment

Dew point range: +5°C to 89.5°C Depend of the equipment

Nominal voltage: 400 V 3/ PE 50 Hz Depend of the equipment

Nominal output: Depend of the equipment

Nominal current: Depend of the equipment

Compressor: Depend of the equipment Refrigerating agent: R404A

CE

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1. General Information

1.1 Handling of the operating instructions

These operating instructions are to be permanently available on the installation.

These operating instructions are to be read and applied by any person working on/with the installation, i.e.

- operating, including equipping, care or trouble-shooting
- service and maintenance
- transport

These operating instructions aim at facilitating the knowledge about the machine and the machine handling.

These operating instructions include important remarks for a secure, correct and economic installation operation. They contribute to avoid dangers, to prevent repair costs and to reduce the failure times as well as to increase the reliability and the serviceable life of the installation.

These operating instructions contain instructions and information concerning the CTS range of climate test cabinets type C.

They describe the assembly, starting-up and function of the installation.

They also include details in the case of failures and for maintenance works.

The abbreviation CTS is used in these operating instructions as a company designation for Clima-Temperatur-Systeme.
The type designation of the CTS range of cabinets consists of

i.e. Type C –40/600

1) C	means:	Climate
2) -40	means:	low temperature -40°C
3) 600	means:	600 litres test space volume

We reserve the right to make technical modifications, compared with representations and information given in these operating instructions, aiming at an improvement of the installation, as long as they are not in contradiction with security aspects,.

2. Safety regulations and equipments

2.1 Safety regulations

All regulations as listed below have been observed for the design and the manufacture of the installation.

2.1.1 EC Directives and National Legislation

- EC Directive for machines 98/37/EC
- EC Directive on Low Voltage 73/23/EEC in the version 93/68/EEC
- Directive on EMC 89/336/EEC in the versions 92/31/EEC and 93/68/EEC
- Device safety law in the version of 28-09-95
- Directive for pressure devices 97/23 EC

2.1.2 Mechanical Norms

- EN 292-1,2 (issue T1 11/1991 ; T2 06/1995)
- EN 294 (issue 08/1992)
- EN 378-1,2,3,4 (issue 06/2000)
- EN 563 (issue 01/2000)
- EN 61310-1,2 (issue 09/1996)
- DIN 8901 (issue 12/1995)

2.1.3. Electrical Norms

- EN 50081 (issue 03/1994)
- EN 61000-6-2 (issue 12/2001)
- EN 61010-1 (issue 03/1994)
- DIN 12880 (issue 11/1978)
- DIN VDE 0100-410 (issue 01/1997)
- BGV A2 (issue 1998)

2.2 Safety remarks

2.2.1 Signal words

The following signal words (acc. to ANSI Z535.4) are used in these operating instructions

DANGER means an *immediate threatening danger.* If nothing is done to avoid it, death or very severe injuries *will* follow.

WARNING means a *possibly dangerous situation.* If nothing is done to avoid it, death or very severe injuries *may* follow.

CAUTION means a *possibly dangerous situation.* If nothing is done to avoid it, light injuries *may* follow.

ATTENTION means a *possibly damaging situation.* If nothing is done to avoid it, the *product* or something in its environment *may* be damaged.

REMARK indicates application recommendations and other particularly useful situations

2.2.2 Warranty and liability

Attention: **It is absolutely necessary to read these operating instructions before starting-up the installation in order to prevent damages and failures due to wrong handling.**
The operation of the installation as well as its maintenance must be performed by instructed and authorised personnel.
We decline any responsibility and any warranty in the case of handling malpractice against these operating instructions.

The installation has been checked before its delivery with respect to its perfect function and safety.

Any modification of the installation requires the agreement of CTS.

2.2.3 Application in accordance with the purpose / Misuse

The installation is designed, constructed and manufactured for the sole application consisting in trials for temperature and climate tests.

The installation **cannot** be used for tests on explosive, corrosive, toxic or easy inflammable materials nor with specimens generating or releasing such materials.

Danger : No living being is allowed to stay in the test chamber. There is danger to life.

Danger : The preparation of any food with the installation is prohibited.

The observance of the operating instructions and of the maintenance prerequisites as described in chapter 8, belong to the scope of applications in accordance with the purpose.

The installation is to be used only in a technically perfect condition, as well as in accordance with its purpose, under observance of safety rules and dangers, and following these operating instructions.
Malfunctions must be eliminated immediately.

The installation is built according to the to-date technical knowledge and recognised safety-related rules. Its application can however cause risks to the life of the user or to the life of third persons or prejudices to the installation or to other material property.

Warning: The owner must compile operating instructions for the operators of this installation regarding the security measures with regard to the handling of a refrigerating installation resp. with the applied refrigerating agents.

2.2.4 Limits of the machine

Refer to the drawing of the devices (see chapter 4.1) for the limits of the machine.
The operation takes place from the door side.

2.2.5 Warning against remaining dangers

Caution: **Depending upon the test temperature set, there is a risk of injuries inside the test chamber, if you touch hot surfaces ! This is also valid after the test run.**

Caution: **Depending upon the test temperature set, there is a risk of injuries inside the test chamber, if you touch cold surfaces ! This is also valid after the test run.**

2.3 Safety devices / Protection caps

The installation is equipped with the following safety devices:

Maximum pressure governor in the refrigeration circuit
Temperature limiter in the test space
Specimen protection device (option)

If a safety equipment is actuated the installation remains switched off. A restart is only possible after the elimination of the trouble (see chapter 7: Malfunctions)

The installation is equipped with the following protection caps:

Protection against accidental contact in the test chamber, for the elements in the air processing system.
Protection cover for the electric section
Protection covers for the machine section
Protection against accidental contact with the fan on the condenser.

Warning: **Never remove the protection caps. The user has to check before any start whether all protection caps are correctly mounted.**

2.4 Behaviour in Case of Emergency in relation with refrigerating agents

The safety data sheets for the applied refrigerating agents are to be observed!

Refer to the safety data sheets for the respectively necessary personal protection equipment.

CAUTION : **If missing of refrigerants, the chamber has to be switched off and service of CTS has to be called. The security remarks in the safety data sheets in appendix has to be observed.**

3. Starting-up: Preparation and Execution

3.1 Requirements for the place of installation

Attention: **CTS uses refrigerants of the group 'L1' according to EN 378-1 part 5.4 .**
Installation of refrigerating is designed according to EN 378-1 for class B of the installation ranges.
According appendix 'C' of EN 378-1 there are no limits regarding the quantity of the refrigerants filling, if the chamber will be installed at ground floor or at underground/upper floor with enough emergency exits.
Otherwise for quantity of refrigerant filling following dimensioning value will be responsible for :
R404A → 0,48 kg/m³ (m³ - volume of installation room)
R 23 → 0,68 kg/m³
Please take the quantity of refrigerant from thetype plate of the chamber, the curcuit with max. refrigerant filling will be considerable.
The owner or the operator must take into account this conditions!

The admissible ambient temperature lies between +15 and +30°C, and the admissible ambient humidity between 20 and 75 % rel. humidity. The place must be well ventilated and dry. The floor must be plane.
Refer to the equipment drawing for the floor space required.

3.2 Installation and preparation of the test cabinet

Attention: **Transport the test cabinet only with the supplied pallet! Refer to the technical specifications, chapter 4.2 for the weight.**

Install the test cabinet as follows:

1. Unpack the test cabinet and check the extent of supply.

2. Remove the accessories from the test space or from the supplied boxes.

3. Adjust the test cabinet on the workshop floor using a spirit level and turning the adjustable footing.

Attention: **Never use the test cabinet without its adjustable footing or rollers!**

4. If equipped with rollers*, engage the roll stop device

5. Discharge from test cabinet and condensate into gully hole to be arranged by the user.

6. Connect cooling water supply* and runback pipes for the water-cooled version. Refer to equipment drawing for the position of the supply connections.

Attention: **Absolutely keep following cooling water parameters:**
Supply temperature min. : 12°C
Supply temperature max. : 28°C
Water pressure : 3 - 6 bar
Pressure lost : min 1,5 bar
Water consumption at Δt_w=10K : approx. 0,6 m³/h
Customer's system to be bump-free.
Particle-free water with pH-value ab. 7

7. Filling up of the reservoir canister of the climatic system positioned behind the front cover of the substructure.

Attention: **Repeatedly switching on the humidity system without water in the reservoir canister leads to a destruction of the backfeeding pump.(First acknowledge the error message E7 when water filling up has been done)**

Attention: **Absolutely keep the following parameters for the moistening water:**
demineralized water with max. conductivity 10µS
pH-value 6 to 7
free of algae

Remark: Test cabinets without automatic water backfeed device require a reservoir refill just after the original filling of the climatic system! Regularly check the level!

8. If the test cabinet is equipped with an automatic water backfeed device*, the connection is made to the user's deionized water network.

Attention: **Keep following parameters for the deionized water network!**
Supply temperature . max. 20°C
Pressure: 3 to 6 bar
No water hammers nor pressure variations within the system.

Attention: **In the case of an automatic water backfeed, waste water run-off must be free. A run-off hose connected by the user must bedirected into the gully hole without any superelevation. Minimum hose size R 1/2“, maximum hose length 1.5m!**

Caution: **The waste water can by very hot!**

9. Should you use a deionization device*, connect it to the installation with the set of hoses belonging to the scope of supply. Connection at the bottom on the reverse side of the installation.
   The deionization device is connected by the user to an electric power supply (230V , 50 Hz) and to a service water network (R 1/2“).

Caution: **Keep following water network parameters!**
Supply temperature max. 20°C
Pressure: 3 to 6 bar
No water hammers nor pressure variations within the system

Caution: **For the connection of the deionization device, observe by all means the assembly and operating instructions from Seral, particularly the short instructions for beading gaskets and washers into the Seralplus set of hoses SD.**

Attention: **It is necessary to bleed at least 20l water when setting a deionization cartridge into operation in order to achieve the admissible conductivity. Only after that, the cartridge can be connected to the climatic test cabinet.**

Attention: **Controll the display of the deionization device weekly. Water quality see chapter 3.2, topic 7.**

10. Connect the compressed-air supply* to a compressed-air ductwork system from the user.

Attention: **Observe following compressed air parameters!**
Pressure: 6 to 10 bar overpressure
max. inlet temperature +35°C
quality classes acc. to ISO 8573-1 :
by direct discharge of the compressed air : particle, water and oil content : class 3
by using an air dryer : particle and oil content : class 3; water content : class 6

11. Close entry port with plugs.

Remark: If you put in wires or pipes, the entry port must be closed with plastic sealing (i.e. from Bostik). The sealing material must be appropriate for the range of temperatures.

12. Before connecting the electric power supply, check the tension, the frequency and the mains fuse at the user's workshop and compare them with the indications on the nameplate. The nameplate is under the main switch.

13. If the parameters are correct, connect the test cabinet to the electric power

supply.

Attention: **Switch on the test cabinet only after it has reached the admissible ambient temperature of +15°C to +30°C!**

*optional equipment

3.3 Starting-up

1. Place a suitable specimen into the test space

Attention **Exothermal specimen in the switched-off installation would heat the test space at unacceptably high values. The operator must ensure that the heat loss from the specimen is interrupted when the machine is stopped (even in the event of a malfunction). The interruption can i.e. be performed with the potential-free interference contact.**
(See connection diagram BG 00 page 1 for the connection)

2. Check whether all jobs described under 2.1 or whether due maintenance jobs have been carried out
3. Turn main switch on “I“
4. Start further equipment, such as deionization installations or compressed-air drier*, if available
5. Check the sense of rotation of the ventilator once the installation has started. (see direction arrow on the ventilator motor).
6. Check the sense of rotation of the ventilator for the condenser once the installation has started (see direction arrow on the ventilator motor).
7. Place the sensor (Pt 100) of the specimen protection device* onto the specimen and adjust the maximum temperature for the specimen on the specimen protection device*.
8. Set the reversing cock* for moistening water in the required position.

Attention: **Depending upon the climatic programme and the contaminant emission from the specimen, it is necessary to drain the moistening water into the gully hole each 2nd to each 5th day. The climatic system must furthermore be rinsed. For that purpose, switch the climate operation on, wait 5 min., then switch the climate off with the temperature control still running.**

Attention: **If the reversing cock brings back the moistening water into the canister, refill only 2/3 of the canister because it would otherwise be filled to overflowing when the climatic system is drained off.**

The installation is now ready to work and can be operated with the corresponding inputs on the control unit (see chapter 4) or through the interfaces RS232 or RS485.
*optional equipment

3.4 Closing down

Before a longer standstill of the installation or in order to replace the water in the bowl-type humidifer, it is necessary to set the moisture channel first on 0. Before actuating the main switch, the installation must still run about 5 minutes with active temperature control.

Attention: **With a water-cooled condenser* of the refrigerating machine, the water must be entirely removed from the cooling water circuit. If this is not done, damages can occur due to frost. It is appropriate to blow off the water with compressed air.**

The following storage conditions are to be observed for longer immobilisation periods:

ambient temperature + 5°C to + 30 °C
dry, clean atmosphere
even floor surface
it is appropriate to cover the whole installation with a plastic sheet.

3.5 Shutdown, disposal

Contact CTS if an elimination is required after the shutdown of the installation.
The owner must in particular take care that the elimination of the operating mediums (refrigerating agents, possibly heat transfer liquid and refrigerating machine oil) takes place professionally and correctly and according to the respectively valid state of the pertinent directives.

4. CTS-Chamber

4.1 Position of accessories and connections + dimensions

This space is open for the sketch of the machine

4.2. Technical performance characteristics

Temperature tests:

Temperature range	-40°C to +180°C
Temperature fluctuation under stabilized conditions	±0.1 to ±0.3 K temporary

Depend of the equipment

4.3 Description of the installation

The function or the material property of a specimen under the influence of temperature and humidity can be tested using the temperature test cabinet.

The correct ventilation with an accordingly high quantity of circulating air is the warrant for a good transmission onto the specimen.

The air treatment space is on the back of the interior space.
The aggregates which are easily accessible from any side, are in the subconstructure of the installation. The control unit is integratet in the construction on the rear side of the cabinet.
The operating unit is user-friendly integrated in the door of the test space.

5. Control unit of the installation

5.1 Control in general

The control unit is on the door, in the attached construction on the back side of the installation.

Warning: **Only electricity specialists are allowed to open the electric box.**
Before opening
1. Place main switch on "0"
2. Unplug mains plug
3. Protect the installation against restart

The main switch is on the right-hand side of the switch cabinet.
The switch for the test space lighting is on the right-hand front side. When you push it the test space light run for maximum 12 minutes.
The plug-type connections for the potential-free contact, the digital and analog inputs and outputs, as well as the interfaces, are on the side of the electric cabinet, on the backside of the construction.
The cable entry takes place above the electric cabinet, through the leading-in rail.

5.2 Specimen protection device (option)

To protect the specimen against a too high temperature rise, a separate regulator is mounted above the main switch. The specimen protection device has its own temperature probe (Pt 100) within the test chamber. This Pt 100 can be freely moved and it can thus be fixed directly onto the specimen.
The upper display on the specimen protection device is the effective value of the free probe on the specimen. The lower display is the limit value. The limit value is adjusted with the ⇑ and ⇓ keys. If the effective value exceeds the limit value the installation is switched off.
(See chapter 7 Malfunctions for re-starting the installation).

5.3 Digital outputs (option)

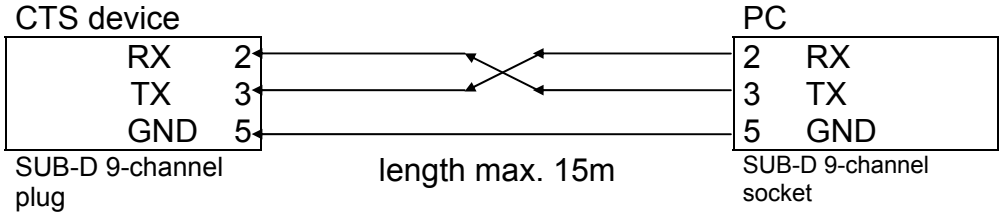
The digital outputs are potential-free contacts which can be used by the customer, i.e. for triggering specimens or measuring devices.
Refer to the flow sheet BG 15 for the connection configuration.
Output triggering takes place via the operating panel or the interface (chapter 6).

5.4 Digital inputs (option)

The digital inputs are to be realised by the customer as potential-free contacts. The digital inputs can be scanned via the interface or displayed or defined with the CTS CID software.
Refer to the flow sheet BG 15 for the connection configuration.

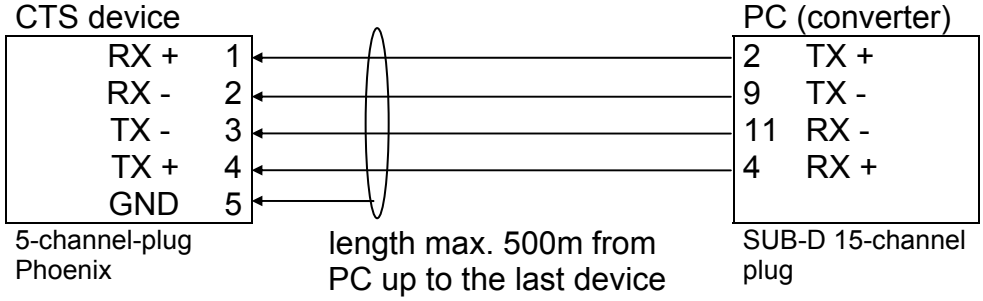
5.5 Interface ports

Interface RS 232
To connect a CTS device to the PC, a RS 232 interface cable belongs to the standard scope of supply.

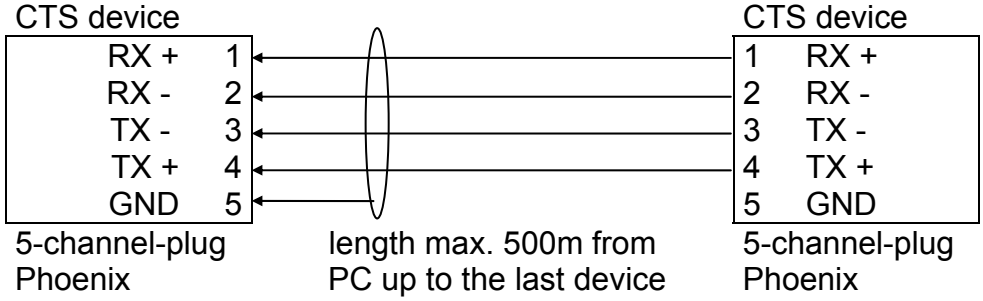


Interface RS 485 (OPTION)
For longer lines or if several devices are to be connected in a network, the interface RS 485 is necessary. A converter or a fixed installed RS 485-interface are required on the PC for this purpose.
The connection cables are to be made as 4 lead screened cables.
(i.e. LIYCY 4x 0.25 mm2)

Connection cable CTS device - PC (converter RS485 - RS232)

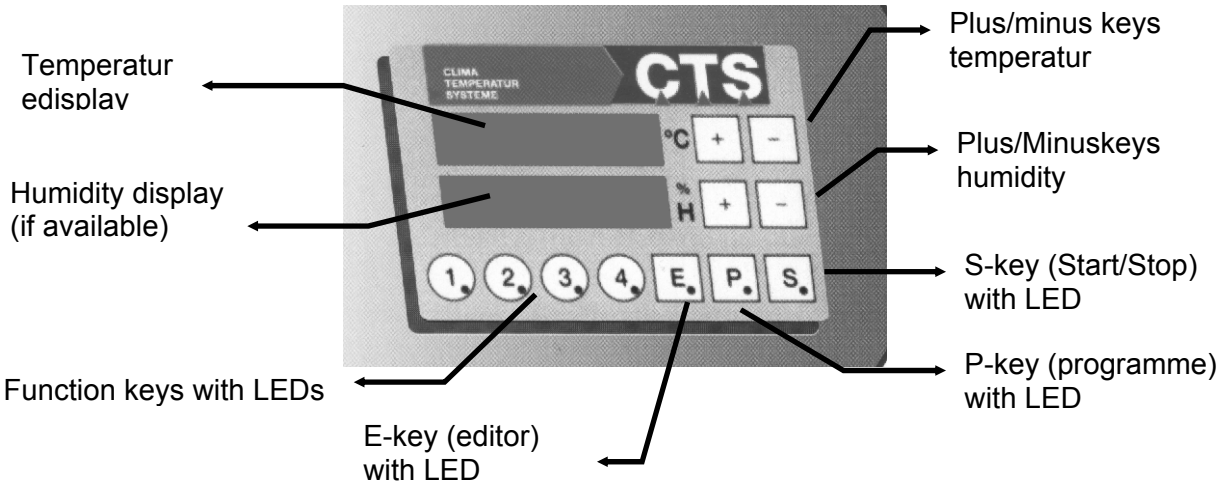


Connection cable CTS device - CTS device



6. Operation with CTS operating unit

The CTS operating unit allows to operate the installation by hand meaning with fixed values or automatically with previously written programmes.



The **operational mode of the installation** can be read from the state of the green luminous diodes in the P key and in the S key:

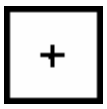
LED in P key on:	automatic mode (see topic 6.2)
LED in P key off:	manual mode (see topic 6.1)
LED in S key on:	installation is running
LED in S key off:	installation is stopped
LED in S key flashes:	operation interrupted in automatic mode

Temperature limits can be set as a **specimen protection**.
If the actual value in the test space exceeds or remains under the pre-set limits, the installation is switched off.
(See topic 6.3 Software Temperature limiter)

6.1 Manual Mode

In the manual mode, the set index values are regulated as constant values. The installation runs in the manual mode, if the LED in the P key is off.

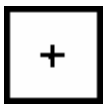
Adjusting the temperature index value



key on temperature display → higher index value

key on temperature display → lower index value

Adjusting the humidity index value (if available)



key on humidity display → higher index value

key on humidity display → lower index value

Remark:

- To cut out the humidity, the humidity index value is given by "0".

- To restart the humidity, the humidity index value should be pre-set on a value within the limits of the installation.

Starting the installation

key → starts the installation if it was switched off (green LED in S key is on)

Remark:

- the index values "F" and the actual values are displayed alternately, if the installation has started.

Stopping the installation

key

→ stops the installation if it was switched on (green LED in S key is off)

Additional functions

1-2-3-4 key

→ activates / deactivates the respectively assigned function.
(green LED in the respective key is on /off)

Key assignment:

Key	Function	Description
1	free	
2	free	
3	free	
4	free	

Malfunction indication

Temperature display	→ shows the temperature
Humidity display	→ “ E “ and error code number flash
	(see topic 7 - Malfunctions on equipment)

Once the cause of the error has been eliminated, teh error can be acknowledge.

key	→ If the error has been eliminated, it is acknowledged and the installation restarts.

6.2 Automatic Mode

Switch the installation on STOP (green LED in [S] key is off)

Starting the installation in the automatic mode

[P] key → opens the mode "Automatic"

[+] or [–] key of temperature display → select programme number

Remark:

- The humidity display shows the actual time as xx.xx h.
  If necessary, the starting time can be freely selected by actuating the

[+] or [–] key of humidity display → select starting time xx.xx h.

If the installation should start only on the next day, the time can be set after 24.00 h.

In this case, the temperature display shows the starting date. With the [S] key you take over the adjusted time. The programme starts then at the defined time.

(Display: LED in [P] key on, in [S] key off)

If the installation should start immediately, continue with:

[S] key → starts the installation
(green LED in S key and in P key are on)

Programme interruption:

S key → the installation interrupts the programme cycle. The index values and the programme running times remain. The ventilator and the temperature control of the installation are switched off.
(LED in S key flashes)

Then either

Programme continuation:

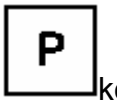
P key → the programme cycle continues
(LED in S key and in P key on)

or

S key → the programme cycle is finished. For the following start, the cycle starts from the beginning on. (green LED in S key and in P key off)

Remark:

- If necessary, the programme number of the running programme can be asked for by pressing the:



key

→ “ P “ and the current programme number are shown

→ the humidity display shows the remaining running time of the line.

→ in the 2nd step the current quantity of the executed loops is shown “ LC“

Temperature display: passes of main loop
humidity display: passes of present loop (only for interlaced loops)

Remark:

In the case of a misoperation, stop the programme with the S key and repeat the operation with the desired programme number.

6.3 Software - Temperature limiter

The temperature limiter software allows to limit the range of temperature of the installation. If the effective temperature value is not within this range, the temperature control trips and the control unit indicates an error.

Press following keys one after the other:

E key	
P key	→ opens the mode "Temperature limiter"
+ or – key of temperature display	→ temperature limiter max.
+ or – key of humidity display	→ temperature limiter min.
S key	→ save

Remark:
The control unit manages different limit values for manual and automatic modes. This means that, if the temperature limits are modified during an automatic programme run, these limits are only valid until the actually running programme is finished.

S key	→ save

6.4 Interface configuration

Press following keys one after the other:

E key

P key

P key → opens the mode "Interface driver"

+ or – key of temperature display → 0 = CID display = „cid. 0“

+ or – key of humidity display → = set address

+ or – key of temperature display → 1 = ASCII protocol display „ASC. 1“

+ or – key of humidity display → = set address

+ or – key of temperature display → 2 = printer display „EPS. 2“

+ or – key of humidity display → 0 = 60 mm/h display „60“

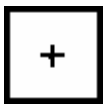
→ 1 = 30 mm/h display „30“

→ 2 = 6 mm/h display „6“

+ or – key of temperature display → 3 = time display „clo. 3“

or

key of humidity display → = set time

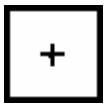


or

key of temperature display → 4 = date day/month display „ clo. 4“

or

key of humidity display → set date

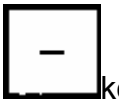


or

key of temperature display → 5 = date year display „ clo. 5“

or

key of humidity display → set year

or 

key of temperature display → 6 , 7, ... further configuration, only for service purposes.

key → save the configuration

6.5 Automatic Editor

Head of programme:

E key	→ opens the mode " Editor "
+ or – key of temperature display	→ select programme number
S key	→closes the input of the programme number
1-2-3-4 key	→ time base → 1 = minutes →2 = hours →3 = real time (without function)
S key	→closes the head of programme

Programme body:

Input of 1st pair of temperature/humidity

+ or – key of temperature display	→ index value for temperature Display „P xxx.x"
+ or – key of humidity display	→ index value for humidity With an index value of 0, the humidity is switched off
1-2-3-4 key	→ switching on/off the additional functions

S key → closes the entry of the 1st pair of temperature/humidity. The display changes to the run time input for the 1st programme step

\+ or – key of temperature display → run time
- display " ´ " for time base in minutes
- display " h " for time base in hours
- real time shows the current time

Remark:

- The current programme line " L xx" is shown in the humidity display

S key → closes the run time input for the 1st line

Remark:

A defined starting value with run time t = 0 minute should always be programmed as first line so that the automatic control does not take over the value ending the last checking operation.

- If necessary it is possible to programme a loop.

Method:

S key → Temperature displays changes to „'„ Humidity display changes to „L..."

\+ or – key of humidity display → number of loops
(the display changes to " SA xx " according to the beginning of the loop, xx loop passages)

For the rest continue with:

+ or – key of temperature display	→ index value for temperature
+ or – key of humidity display	→ index value for humidity
1-2-3-4 key	→ switching on/off the additional functions
S key	→ closes the input of the 2nd pair of temperature/humidity. The display changes to the run time input for the 2nd programme step
+ or – key of temperature display	→ run time - display " ´ " with time base in minutes - display " h " with time base in hours
1-2-3-4 key	→ switching on/off the wait function. i.e. temperature = key # 1 humidity = key # 2 The range of tolerance for the wait function can be given in the humidity input field with the +/- key. - Display " Hold 0 " Wait for temp - Display " lo 5.0 " Tolerance 5°

Remark:

- The range of tolerance defines with which index value deviation (+-) the next step in the programme runs.

key → closes the input of the run time of t the 2nd line

Remark:

If a loop has been programmed, it must also be closed.
Method:

After the input of the xth programme step

key → closes the input of the run time of the xth line

key → temperature display changes to „‘„ humidity display changes to „L ...“

key of humidity display → press the + key to define the end of the loop (display changes to “ SE “ corresponding to end of loop)

key → closes the input of the end of loop

Programme end:

either:

key → sets the programme end onto the current line
(display changes to " PE xx " corresponding to programme end, xx = programme number and " PL xx " corresponding to current line, xx = current programme line)

then:

key → quits the editor without saving

or

key → quits the editor and saves the programme up to the current line

or:

key → quits the editor and saves the total programme

Remark:

- Proceed as follows to visualize or to check the programme:

E key

\+ or – key → select the programme

S key, S key, S key → passage

- In the case of a wrong input, quit the programme pressing 2 times the E key.
  Restart the editing process and click on S key until your arrive at the line to be modified.

Remark:

- It is possible to cancel or to shorten a programme if you set the programme end onto the first line. Method:

E key

\+ or – key → select the programme

S key → display time base

S key → display first programme line

E key → display programme number and line zero

P key → save the programme up to line zero

The programme now includes only one remaining line. Editing will place the index values as pre-setting onto the corresponding values of the previous line.

6.6 Special menus

6.6.1 Display of power outage times

Press successively

E key

P key

P key

P key → opens the mode "Power outage time".

The control unit saves the 10 last power outages with their dates and times.

Temperature display: P.off (Power off n° 1 = last power outage)
Humidity display: Date of the power outage

\+ or – key of the temperature display → page up or down to consult the saved power outages. ("-" brings you to the older power outages).

\+ or – key of the humidity display → change between date and time.

S key → quit the menu

6.7 Interface protocol CTS control <--> PC

(subject to modifications)

General: **Set the interface on the operating unit on „ASC 1“ and save the setting with the S key.**

Interface:	RS 232
Baud rate:	19,200 bauds
Format:	8 bits, ODD parity (the parity bit completes the total of 1s to an odd figure)
Data flow control:	none
Framing:	„STX“ „Data“ „CHK“ „ETX“ STX = 0x02 ETX = 0x03 CHK = XOR connection of all data (without STX, ETX nor CHK) The highest bit (bit 7 resp. MSB) of the data and of the CHK always is 1. Example: ASC „1“ = DEC 49 or DEC 128 = dec 177 resp. HEX 0x31 or HEX 0x80 = HEX 0xB1. ADR = 0x81 - 0xA0 (address 01 - 32); is set through the software. Default = 0x81 (address 01).

But for „ETX“ and „STX“, the highest bit (MSB) is always 1.

Commands and responses:

Set time

PC to CPU:

„STX“ „ADR“ „t“ date time „CHK“ „ETX“

„t“ ASCII code 0x74 OR 0x80 = 0xF4

date DDMMYY per byte in ASCII OR 0x80 (6 bytes)

time HHMMSS per byte in ASCII OR 0x80 (6 bytes)

Example: ADR = 1, date = 241196, time = 145535

String = 0x02 0x81 0xF4 0xB2 0xB4 0xB1 0xB1 0xB9 0xB6 0xB1 0xB4 0xB5 0xB5 0xB3 0xFF 0x03 (17 bytes)

CPU to PC:

„STX“ „ADR“ „t“ date time „CHK“ „ETX“ (set value)

Read time

PC to CPU:

„STX“ „ADR“ „T“ „CHK“ „ETX“

„T“ ASCII code 0x54 OR 0x80 = 0xD4

CPU to PC:

„STX“ „ADR“ „T“ date time „CHK“ „ETX“ (read value)

Set analog parameters

PC to CPU:

„STX“ „ADR“ „a“ channel no._value „CHK“ „ETX“

„a“ ASCII code 0x61 OR 0x80 = 0xE1

Channel no. one byte in ASCII OR 0x80

_ blank = 0x20 OR 0x80 = 0xA0

Value format XXX.X (for negative values -XX.X) per byte in ASCII OR 0x80

Remark: if several channels are available, each one must be set separately

Example: ADR = 1, channel no. = 0 (temperature channel), value = -14.5°C

String = 0x02 0x81 0xE1 0xB0 0xA0 0xAD 0xB1 0xB4 0xAE 0xB5 0xC3 0x03 (12 bytes)

CPU to PC:

„STX“ „ADR“ „a“ „CHK“ „ETX“

Read analog parameters

PC to CPU:

„STX“ „ADR“ „A“ „Channel no.“ „CHK“ „ETX“

„A“ ASCII code 0x41 OR 0x80 = 0xC1

Channel no. one byte in ASCII OR 0x80

Example: ADR = 1, channel no. = 0 (temperature channel)

String = 0x02 0x81 0xC1 0xB0 0xF0 0x03 (6 bytes)

CPU to PC:

„STX“ „ADR“ „A“ Channel no._effective value_index value „CHK“ „ETX“ (read value)

Channel no. one byte in ASCII OR 0x80

_ blank = 0x20 OR 0x80 = 0xA0

Effective value format XXX.X (-XX.X for negative values) per byte in ASCII OR 0x80

Index value format XXX.X (-XX.X for negative values) per byte in ASCII OR 0x80

Example: ADR = 1, channel no. = 0 (temperature channel), effective value = -14.5°C, index value = -13.8°C
String = 0x02 0x81 0xC1 0xB0 0xA0 0xAD 0xB1 0xB4 0xAE 0xB5 0xA0

0xAD 0xB1 0xB3 0xAE 0xB8 0xFA 0x03 (18 bytes)

Remarks: if several channels are available, each one must be read separately.

Read status

PC to CPU:

„STX“ „ADR“ „S“ „CHK“ „ETX“
„S“ ASCII code 0x53 OR 0x80 = 0xD3
Example: ADR = 1
String = 0x02 0x81 0xD3 0xD2 0x03 (5 bytes)

CPU to PC:

„STX“ „ADR“ „S“ Info1 Info2....Info9 „CHK“ „ETX“ (read value)
Info1 to info 9 „0“ = „OFF“
„1“ = „ON“
per byte in ASCII OR 0x80 (0xB0 or 0xB1)
Info1 = Start/stop
Info2 = Collective failure
Info3 = Temperature control
Info4 = Humidity
Info5 = Key 1
Info6 = Key 2
Info7 = Key 3
Info8 = Key 4
Info9 = Error number

Example: ADR = 1, info1 = 1, info2 = 0, info3 = 1, info4 = 1, info5 = 0, info6 = 0, info7 = 0, info8 = 0, info9 = 0
String = 0x02 0x81 0xD3 0xB1 0xB0 0xB1 0xB1 0xB0 0xB0 0xB0 0xB0 0xB0 0xE3 0x03 (14 bytes)

Set digital parameters

PC to CPU:

„STX“ „ADR“ „s“ Index_value „CHK“ „ETX“
„s“ ASCII code 0x73 OR 0x80 = 0xF3
Index Read the info. number according to the status (data record „S“ in ASCII code OR 0x80
i.e. the index 2 corresponds to the collective failure.
Blank = 0x20 OR 0x80 = 0xA0
Value „1“ or „0“ correspond to ON or OFF

Examples: Switch the installation on/off: ADR = 1, installation ON = 1 (index = 1)
String = 0x02 0x81 0xF3 0xB1 0xA0 0xB1 0xD2 0x03 (8 bytes)

Acknowledge error: ADR = 1, acknowledge collective failure = 0 (index 2)
String = 0x02 0x81 0xF3 0xB2 0xA0 0xB0 0xD0 0x03 (8 bytes)

CPU to PC:
„STX“ „ADR“ „s“ Index „CHK“ „ETX“

Read programme status

PC to CPU:
„STX“ „ADR“ „P“ „CHK“ „ETX“
„P“ ASCII code 0x50 OR 0x80 = 0xD=
Example: ADR = 1
String = 0x02 0x81 0xD0 0xD1 0x03 (5 bytes)

CPU to PC:
„STX“ „ADR“ „P“ XXX „CHK“ „ETX (read value)
XXX = actual programme number (3 ASCII characters, 001-099)
000 = no programme currently running
Example: ADR =1, programme 1 runs (30hex or 80 hex, 30 hex or 80 hex, 31 hex or 80 hex)
String = 0x02 0x81 0xD0 0xB0 0xB0 0xB1 0xE0 0x03 (8 bytes)

Start/stop programme

PC to CPU:
„STX“ „ADR“ „p“ XXX „CHK“ „ETX“
„p“ ASCII code 0x70 OR 0x80 = 0xF0
XXX number of the programme to be started (001-099)
000 = stop the programme
Examples: ADR = 1, start programme 1
String = 0x02 0x81 0xF0 0xB0 0xB0 0xB1 0xC0 0x03 (8 bytes)

ADR = 1, stop programme
String = 0x02 0x81 0xF0 0xB0 0xB0 0xB0 0xC1 0x03 (8 bytes)

CPU to PC:
„STX“ „ADR“ „p“ XXX „CHK“ „ETX“ (read value)

Example: ADR = 1, start programme 1
String = 0x02 0x81 0xF0 0xB0 0xB0 0xB1 0xC0 0x03 (8 bytes)

Read text of error

PC to CPU:

„STX“ „ADR“ „F“ „CHK“ „ETX“

„F“ ASCII code 0x46 OR 0x80 = 0xC6

Example: ADR = 1

String = 0x02 0x81 0xC6 0xC7 0x03 (5 bytes)

CPU to PC:

„STX“ „ADR“ „F“ „TEXT“ „CHK“ „ETX“ (read value)

TEXT = text for the error memorized in the control unit. Length always 32 ASCII characters.

If there is no error, TEXT is sent back with 32x'' (blank).

The total length of the data record always is 37 characters.

The formation of the check sum occurs in the same way than for the other data records.

7. Possible Malfunctions of the Installation

Warning: **Only authorised and duly instructed personnel is allowed to eliminate malfunctions.**

The occurrence of a possible malfunction is indicated on the operating unit with a flashing "E" in line 2 with the corresponding error number and the light + buzzer goes on.
Depending upon the malfunction, the whole installation or only a part of it (i.e. humidity system) is switched off.

Once the failure has been repaired, press the "S" key to acknowledge the failure message. The installation restarts then and can be operated as usual.
Depend of the equipment

Error number	Meaning of the error number	To repair the failure
E 0	Thermal protection of test chamber ventilator 1 released. 02-F2.1 Installation completely disconnected	Check whether the test chamber ventilator is dirty, easy-running and check the cooling air supply.
E 1	Temperature limiter in test chamber released 01-F1.1 Installation completely disconnected	Inform CTS after-sales service
E 2	Maximum pressure governor in refrigeration cycle released 03-F3.1 Installation completely disconnected	Clean condenser or check air supply, for water-cooled installations, check the cooling water supply.
E 3	Specimen protection device (option) released 09-A1 Installation completely disconnected	Check adjusted index value as well as pre-set limits on specimen protection device
E 4	Reaction of temperature limiter software 08-B1.1 Installation completely disconnected	Check adjusted index value as well as pre-set limits
E 5	Reaction of humidity limiter software 08-B2 Humidity system is disconnected. Temperature control continues to run	Check adjusted index value as well as pre-set limits
E 6	Thermal protection of ventilator on condenser released. 03-F5.2 Installation completely disconnected	Check whether the ventilator is dirty, easy-running and check the cooling air supply.

E 7	Water shortage in humidity system. 07-S2 Humidity system is disconnected. Temperature control continues to run.	Fill the reservoir canisters with water or replace the filter of the filling pump. (this error message has to be acknowl-edge with the "S" key)
E 8	not used	
E 9	not used	
E10	not used	
E11	not used	
E12	not used	
E13	not used	
E14	Pt 100 air inlet is defect 08-B1.2 Installation completely disconnected	Inform CTS after-sales service
E15	Pt 100 waterbath is defect 07-B4 Humidity system is disconnected. Temperature control continues to run.	Inform CTS after-sales service
E16	Suction pressure sensor is defect 03-B12 Humidity system is disconnected. Temperature control continues to run.	Inform CTS after-sales service

If you cannot repair a failure, call immediately the after-sales service of CTS GmbH or the after-sales service agency in the corresponding country.

8. Maintenance

Our installations are to a large extent free of any maintenance. Regular attendance and maintenance do however contribute to a failure-free operation of your installation.
Maintenance jobs on the systems belonging to this installation are to be performed only by the manufacturer or his authorised representations.

Caution: **The owner or the operator must ensure that the installation is checked in a satisfying way, regularly monitored and maintained.**

Caution: **Only the manufacturer or his authorised representatives are authorised to proceed to maintenance or resp. repair works on the systems of the installation, in particular filling, draining and replacing of the refrigerating agents or of the heat transfer liquids.**

Attention: **Use only genuine spare parts.**

Warning: **For any maintenance job, the main switch must be off and secured against any restart.**

Some maintenance jobs which can be performed by trained personnel are listed here below.

Time	Element	Work description
After each test	Test chamber	Clean test chamber. To prevent corrosion it is necessary to wash the sides of the test space as well as the bowl-type humidifier and dehumidifier after each test with clear water. Scrapes in the test space container can be removed with an usual domestic cleanser for stainless steel (i.e. Sidol).
	Test chamber door	Clean the seals with clear water. Check whether the door is really sealed all around.
	Condenser	Check dust deposits on the air-cooled condenser and clean it if necessary with a hand brush or a vacuum cleaner. For water-cooled condenser, clean the filter in the water feed.
If necessary	Humidity system	Clean the reservoir canisters with clear water.
	Deionization device*	see separate operating instructions

	Compressed-air drier*	see separate operating instructions
	Inlet filter of humidity system	Replace the filter (order no. 10001092)
	Test chamber lighting	Change the halogen bulb (order no. 10000117).

*optional equipement

Remark: **The repeated checks as listed in EN 378-2 appendix C must be carried out depending on the case which occurred.**
CTS or their authorised representative carry out these repeated checks if one of the listed conditions is given.
The owner or the operator of the installation must order once a year an examination of the security switching devices for pressure control (EN 378-2 appendix C6).

The CTS after-sales service department performs these works and can submit you a corresponding offer.

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